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Title:

EARTHMOVING BLADE AND MOUNTING ASSEMBLY

Lars Goran Kyhlberg	15 Horseshoepassview Llangollen Denbighshire LL20 8LU UNITED KINGDOM
Luciano Argentieri	58 Queen Street Cheadle Stoke on Trent ST10 1BJ UNITED KINGDOM
Martyn Leonard Molsom	22 Trinity Drive Stone Staffordshire ST15 8ET UNITED KINGDOM

Title: Earthmoving Blade and Mounting Assembly

Background to the Invention

This invention relates to an earthmoving blade and mounting assembly which in use, is mounted on an earthmoving machine such as an excavator.

Description of the Prior Art

Such earthmoving blade assemblies typically include a blade, often called a "dozer" blade which extends transversely to the usual direction of travel of the machine, to push earth or the like, to level the earth for example, and at least one, usually two, mounting arms which is/are secured to the blade at their one ends, and at or towards their opposites end mount the blade on a superstructure of the earthmoving machine. Usually the arm or arms are raisable and lowerable relative to the ground, by one or a pair of actuators which extend between the superstructure of the earthmoving machine and the assembly, to permit the blade to be moved to a stowed position above the ground when not required. The dozer blade is sometimes used during digging to steady the earthmoving machine, or even to push/pull the machine over the ground.

A typical such assembly includes a large number of parts and components in order to give the assembly sufficient strength for its intended purpose. Thus for example the mounting arms are typically be box sections which are secured by welding to a rear part of the blade. The welds are strengthened with both transversely extending gussets or the like which are welded at the connections of the arms to the rear part of the blade to increase the effective lateral area of the weld, and typically upstanding gussets are provided, the increase the effective vertical areas of the welds.

Furthermore, the blades themselves typically have a large number of parts, including a rear part to which the arms are welded, which rear part

typically is a channel section, which opens forwardly of the blade, a front part which, in use, works the earth to be moved, and upper and lower intermediate parts which are welded to each of the front and rear parts to assist in connecting these together, as well as the usual grader part at the bottom of the front part which typically is of a thicker metal than the front part, as it is subject to greatest wear in use.

In addition to these parts and components, where a pair of arms are provided, they are interconnected with an interconnecting member to which the actuator or actuators may be connected, and mounting members typically are provided to receive pivots so that the earthmoving member can be mounted on the earthmoving machine. Thus a significant number of parts and components overall is required, making the earthmoving member expensive to make.

Summary of the Invention

According to a first aspect of the invention we provide an earthmoving blade and mounting assembly, the mounting assembly including at least one generally hollow section mounting arm which mounts the blade in use on an earthmoving machine, the arm including a generally sideways opening channel and a generally upright closure plate which closes the open mouth of the channel to provide the hollow, the cross section of the hollow increasing from a mounting position where the arm is mounted on the earthmoving machine to an outer end where the arm is secured to the blade.

In such an assembly, a significant reduction in the number of parts and components can be achieved, with a resultant saving in cost, without compromising the strength of the assembly.

The channel of the or each arm may be made as a pressing as a single component, with the upright closure plate being of a thicker material and thus providing substantial strength to the arm. By suitably shaping the closure plate to conform to the configuration of the blade where it is secured to the blade, the

need for any upstanding gusset is alleviated as the vertical extent of the closure plate may be of a desired magnitude without such a gusset. Furthermore, and as the cross section of the hollow of the arm increases towards a maximum where the arm is secured to the blade, a desired area of weld may be achieved the lateral extent of the arm where the arm is secured to the blade may be of sufficient magnitude that no transversely extending gusset is required.

Thus the cross section of the hollow may increase towards the blade, due to an increase in both the vertical and lateral dimensions of the channel and the closure plate.

In a preferred arrangement the vertical and lateral dimensions of the channel and the vertical dimension of the closure plate, increase constantly and generally linearly from the mounting position to the blade.

The uppermost channel limb may be laterally inclined to the horizontal, as well as longitudinally due to the increasing vertical dimension of the hollow. Thus mud, water and the like will be discouraged from settling on the upper surface of the uppermost channel limb.

At the mounting position of the mounting arm, there may be provided an opening at least in the closure member, and a mounting member may be secured to at least one of the channel and closure plate of the arm, the mounting member including an opening which is aligned with any opening in the closure plate and/or channel to provide a passage which in use receives a pivot which mounts the assembly on the machine superstructure. Thus the mounting member may include a bearing surface to support the pivot.

Preferably the assembly includes a pair of mounting arms, arranged alongside one another and each being secured at or adjacent a respective end of the blade. The closure plates may be innermost and thus facing one another, but desirably, the configurations of the mounting arms are identical so that the arms are not handed, with one arm being inverted relative to the other arm. Alternatively, if the arms are handed, preferably as many as possible of the

parts and components making up the arms, are not handed, so they may be used for either arm. In each case, a low overall different-parts count is achieved.

An interconnecting member may extend between and be secured to the facing closure plates of the arms, which interconnecting member may be for example of circular tubular cross section, and which may provide a mounting for an actuator which in use moves the blade of the assembly up and down relative to the machine superstructure.

The blade may include a rear part to which the or each arm is secured, and a front part which in use, works the earth to be moved. The rear part may be a laterally extending forwardly opening channel, and the front part may, at least along an upper edge thereof, include a rearwardly extending lip which overlaps and is welded to an outside surface of the upper channel limb of the rear part. A lower channel limb of the rear part may be welded to a lower edge of the front part, where a grader part which extends laterally along the blade between its ends, may also be provided.

Thus in such a construction, by suitably fabricating the rear part channel, the provision of upper and/or lower intermediate blade parts may be avoided thereby reducing the number of parts and components of the assembly.

According to a second aspect of the invention we provide an earthmoving machine having mounted thereon, an earthmoving blade assembly in accordance with the first aspect of the invention.

Brief Description of the Drawings

Embodiments of the invention will now be described with reference to the accompanying drawings in which :-

FIGURE 1 is an exploded perspective view of an earthmoving blade assembly in accordance with the invention, showing the individual parts and components of the assembly;

FIGURE 2 is a side view of the assembly of figure 1, assembled;

FIGURE 3 is a plan view of the assembly of figures 1 and 2 in an assembled conditioned, showing in phantom, part of an earth moving machine on which the assembly is mounted.

Description of the Preferred Embodiments

Referring to the drawings there is shown an assembly 10 which includes am earthmoving blade 11, also called a dozer blade, and a pair of mounting arms 12, 14 which mount the assembly 10 on an earthmoving machine M, such as for example only, a so called mini-excavating machine which includes a ground engaging structure carrying wheels or tracks by which the machine may move over the ground, and an excavating arm with an excavating tool such as a bucket. Such machines are often required to perform earthmoving operations such as levelling or grading, and for this purpose are provided with earthmoving assemblies such as shown in the drawings at 10.

The mounting arms 12, 14 at one end, are secured to the blade 11 by welding typically, and at their opposite ends, provide mounting positions 15, 16 as hereinafter explained, to mount the assembly 10 to a superstructure of the earthmoving machine, so as to permit the assembly 10 to be raised clear of the ground, or placed on the ground, by the operation of one or move actuators, such as a hydraulic actuator which extends between the assembly 10 and the machine superstructure.

In accordance with the invention, each arm 12, 14 is fabricated from a sideways opening channel 20 which includes a generally upright orientated base 21, an upper sideways extending channel limb 24, and a lower generally sideways opening channel limb 25.

The channels 20 are conveniently fabricated in steel as pressings, but could otherwise be fabricated as desired, and in other materials.

The mouth of each channel 20 is closed by a respective closure plate 28 which is made of a thicker gauge material than the channel 20 pressings in this example, the plates extending generally vertically upright beyond the mouths of the channels 20. The channels 20 and closure plates 28 therefore provide hollow sections, the hollows of which extend throughout the length of each arm 12, 14.

In accordance with the invention, the cross section of hollow of each arm 12, 14 increases from a minimum at or adjacent the respective mounting position 15, 16 to where the arm 12, 14 is secured to the blade 11. Thus the width of the base 21 of the channel 20, and the depths of the upper and lower channel limbs 24, 25, and the width of the closure plate 28 all generally constantly and linearly increase from the respective mounting positions 15, 16 to the blade 11. Thus whereas the arms 12, 14 are each box sections, the areas of securement of the arms 12, 14 i.e. the areas available for welding, are at a maximum where maximum strength is required, at the outer blade 11 end of the arms 12, 14.

The blade 11 includes a laterally extending rear part 30 which is a forwardly opening channel, with the width of the channel increasing from adjacent a base 31 of the channel 30 towards a front part 33 of the blade 11. The hollows of the arm 12, 14 are preferably as wide as the base 31 of the blade 11, and the closure plates 28 are preferably shaped where they are secured to overlap the limbs of the rear part 20 channel. In this way, there is no need to provide any vertical and/or lateral gussets to strengthen the weld between blade 11 and mounting arms 12, 14 as in prior arrangements which utilise box section arms, the cross sections of which are generally constant along their entire lengths.

At the mounting positions 15, 16, it can be seen that the closure plates 28 extend rearwardly beyond the channels 20, and have openings 35. Mounting members 36 are provided at the mounting positions 15, 16, and the mounting

members 36 include openings 37 which are aligned with the respective openings in the closure plates 28 to provide passages for one or a pair of pivot pins P by which the assembly 10 is mounted on the machine superstructure. To strengthen the welds between the arms 12, 14 and the mounting members 36, the channels 20 are provided with grooves 19 in their respective bases 21, which grooves 19 extend along the arms 12, 14 and the mounting members 36 include sides extensions 22 which overlap the grooves 19 and thus a maximised area for welds is provided further to strengthen the mounting positions 15, 16 at the rearward ends of the arms 12, 14.

The arms 12, 14 are thus arranged alongside one another with a space between, with the closure plates 28 in this example on the insides so as to face one another. Nevertheless, desirably, the arms 12, 14 are of an identical configuration and not handed, with one of the arms 12, 14 being inverted compared to the other. Alternatively, even if the arms 12, 14 are handed, preferably as many as possible of the parts and components of the arms 12, 14 are not handed, so that the total number of different components is maintained at a minimum. Moreover the mounting members 36 which desirably are welded to the respective arms 12, 14, are preferably non-handed, again to maintain the different-parts count low.

Between the mounting arms 12, 14 is an interconnecting member 40 which in this example is of round tubular cross section but could be of another configuration in another example. The interconnecting member 40 is welded or otherwise secured to the arms 12, 14 and not only provides added strength and rigidity to the assembly 10, but also provides a mounting 42 for one end of the actuator which extends between the assembly 10 and the machine superstructure, for raising and lowering the blade 11. Because the interconnecting member 40 is welded to the thick closure plates 28, a strong weld can be achieved without requiring any gussets/gussets or the like which conventionally are required where the interconnecting member 40 is welded to

thinner box sections, and thus again the construction of the invention which utilises the arms 12, 14 with non-constant cross section hollows and substantial closure plates 28, reduces the number of components required to fabricate the assembly 10 compared with known assemblies.

It can be seen that the blade 11 construction includes only the front 33 and rear 30 parts, a pair of side closures 43, 44, and a grader part 46 along a lower edge 52 of the blade 11. This is achieved by shaping the rear channel part 30 as described above, and by shaping the front part 33 with a rearwardly extending lip 48 along an upper edge thereof, which overlaps a rear surface 49 of the upper channel limb 50. Thus there is no need for any intermediate part as is provided in conventional arrangements to enable the front 33 and rear 30 blade 11 parts to be welded together.

At a lower edge 52 of the front part 33, the front part 33 overlaps the inside surface of a lower channel limb 51 of the rear part 30 of the blade 11 and is welded thereto, with the grader part 46 welded along the lower edge 52 on a forwardly facing surface of the front part 33. Thus there is no need for any intermediate part at this position as is conventionally provided, to achieve the necessary strength.

The side closures 43, 44 are again preferably not handed components, and are welded in position to close the ends of a hollow created between the front 33 and rear 30 blade parts to prevent the ingress of earth etc. into the hollow and to provide points by which the machine may be lifted, or tied down, e.g. during transport on a lorry.

It will be appreciated from the above description that if desired, the earthmoving blade and mounting assembly 10 may be made from sub assemblies, such as for example,

i. the blade 11 which sub assembly may include the front 33 and rear 30 parts, the grader part 46 and the side closures 43, 44;

ii. the arms 12, 14 including the channels 20, closure plates 28 and mounting members 36;

iii. the interconnecting member 40 and actuator mounting 42,

thus considerably facilitating and reducing the cost of manufacture compared with known proposals.

It can be seen in the drawings, that the channel limbs 24, 25 of the arm channels 20 are not perpendicular to the channel base 21. Thus upper surfaces provided by the upper channel limbs 24 are laterally inclined to the horizontal as well as longitudinally inclined, and as a result, water or mud or dirt tends not to settle on the upper arm 12, 14 surfaces. Thus, the weight of the assembly 10 is less liable to be augmented by clinging dirt and there is reduced likelihood of corrosion.

Also the rear part 33 of the blade 11 has an inclined upper part of the rear surface 49 to disgorge water and mud etc. settling thereon.

Various modifications may be made without departing from the scope of the invention.

For example, the blade 11 may be of an alternative configuration to that described, and may not include a grader part 46. The arms 12, 14 may be of alternative dimensions and configurations to those described. In particular the closure plates 28 may be shaped alternatively at their outer ends where they are secured to the blade 11, depending on the blade configuration, and particular the configuration of the rear part 30 of the blade 11.

The interconnecting member 40 could be of a rectangular or other box section cross sectional configuration and may for example provide mountings for a pair of actuators. Alternatively the actuator(s) may be mounted to the arms 12, 14.

In another embodiment, a single mounting arm 12, 14 construction may be provided in which case no interconnecting member 40 would be required.

Instead of fabricating/casting/forging or otherwise providing the mounting members 36 at the rearmost ends of the arms 12, 14, a bearing surface for a pivot pin or other mounting to the machine superstructure, may otherwise be provided.

Although in the example described, the blade 11 is secured to the mounting arm or arms 12, 14 by welding, one or other of these could be made in some suitable alternative material, such as a reinforced composite material for example only in which case these may not be secured by welding but by another securing method.